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ABSTRACT

The Federal government operates several programs that provide money, either as loans or as a combination of grants and loans, to students. This paper attempts to clarify the economic and budgetary implications associated with continuing these existing programs, and discusses the differing economic consequences that would follow if some alternative approaches were instituted. Examined first are the goals and public benefits of aid to higher education including economic development of the nation, defense and security, redressing social inequalities, and improvement of the quality of life. In the next section the principal Federal aid programs are discussed: Educational Opportunity Grants, College Work-Study, National Defense Student Loan, and Guaranteed Student Loan Programs. The budget implications of the current programs are contrasted in the next section by computing the costs to the Federal government, state government, institution, and student. The next section discusses the economic implications of the loan and grant programs, and the final section describes what some of the economic consequences may be for the proposed National Student Loan Association. In the appendix formulas are derived that compute the present value of loan costs.
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AN ECONOMIC ANALYSIS OF
ALTERNATIVE PROGRAMS TO
FINANCE HIGHER EDUCATION

Submitted to

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SECTION I
INTRODUCTION

SECTION I

INTRODUCTION

At present, the Federal Government operates several programs which provide money, either as loans or as a combination of grants and loans, to students; furthermore, several proposals to modify or replace these programs are now under consideration in the Administration and Congress. The problem to be addressed in this analysis is to clarify the economic and budgetary implications associated with continuing these existing programs, and discuss the differing economic consequences that would follow if some alternative approaches were instituted.^{1/}

We first examine in Section II the goals and public benefits of aid to higher educations. These benefits include: economic development of the nation, defense and security, redressing social inequalities, and improvement of the quality of life.

In Section III the principal Federal aid programs are discussed: the Educational Opportunity Grants, College Work-Study, National Defense Student Loan, and Guaranteed Student Loan programs. Data are given which describe the magnitudes of these programs and the family income and minority group background of the recipients. The characteristics of proposed future programs are also discussed.

^{1/} The inclusiveness of this report was limited by its manpower allotment of 21 man-days, expended over a three week period.

In Section IV the budget implications of the current programs are contrasted by computing the costs to the Federal Government, State government, institution, and student. In the case of the loan programs, the appropriate discount and default rates were not known, and so the costs were computed by treating these rates parametrically.

The economic implications of the loan and grant programs are discussed in Section V. The first part of this section deals with the macro-economic effects of these programs: the impact of loans and grants with respect to such issues as the level and distribution of income in the society. In the last part, the micro-economic effects of aid programs are considered. Here, the concern is with the impact of the alternative programs on the families of students and on the students themselves, both during the period of schooling and afterwards.

In Section VI, we describe what some of the economic consequences may be for the proposed National Student Loan Association.

And in the Appendix, formulas are derived which compute the present value of loan costs. These formulas were used in the cost calculations in Section IV.

SECTION II

BENEFITS AND GOALS OF FEDERAL AID TO HIGHER EDUCATION

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In order to evaluate the alternative approaches to student support, it is necessary to observe the broader context in which these programs operate, and comment briefly on the general rationale for Federal involvement in State and private institutions of higher learning. In short, why should the public be compelled to support higher education through the dispersion of its tax moneys?

Public Benefits

The first general argument relates to the Federal government's concern with the overall economic development of the nation. Past experience indicates that an extension of opportunities for higher education results in a real increase in the productivity of the aggregate citizenry, by enhancing the pool of skills and career opportunities of graduates. This increase in the productivity of factor inputs which accompanies investment in education results in an increase in the potential output of the economy. Insofar as the economy is able to maintain full employment of the available factors of production, output per capita is higher than it would be in the absence of investments in higher education (6, 9, 10).^{1/}

^{1/} Numbers in parenthesis refer to the references in Section B.

Closely related to the economic development rationale is the defense and security rationale. In this argument, expanded higher education opportunities strengthen the nation in its political and economic relations with the rest of the world, by strengthening its dollar, and stimulating his industrial development. Also, higher education is presumed to ensure the quality of political and military leadership, and produce the scientific and technological depth needed to support programs in military defense, international development, and domestic stability. A higher general level of education is also presumed to enhance the citizenship skills of the electorate, thereby improving the selection of government representatives, who are, in turn, better makers of international and domestic policy. (16)

Aid to higher education, when viewed more selectively as aid to particular segments of the population, can be viewed as a means of redressing social inequalities, that is, as a strategy for providing collectively supported opportunities for people lacking private resources. In this case, the goal is to alter the distribution of higher education so that the poor and lower-middle class can participate in it more easily. While economic development in this segment of the economy will also have broader economic effects, the goal in this case is more selective,

and the factors influencing policy decisions are more complex. (1, 2, 4, 10, 11, 12)

These three broad public purposes--economic development, defense and security, and equality of opportunity, are to some degree, subsumed in the difficult-to-measure notion of quality of life. A recurrent theme in the literature on higher education is that a better educated public enjoys a better quality of experience, by virtue of psychological changes and increased skill in solving social/personal problems and achieving social/personal goals. Increased job satisfaction, income, and intellectual competence are held to be indicators of quality in social life, and they result in the "non-material" benefits of education.

Private Benefits

In addition to these public benefits, there are private benefits as well. Individual citizens experience increased personal rewards--as the result of education they might not otherwise have had, or as a result of receiving that education at reduced personal expense. In this view, one of the goals of Federal aid to higher education is, as in many public programs, to dispense public wealth to private beneficiaries, who become, in effect, interest groups competing for the public treasure, and,

thus, motivated political constituencies. And it is clear that certain aid allocation policies have political implications for legislators. (11, 19)

A special group of private beneficiaries are those lending agencies who receive profit from their commerce in government-administered or subsidized loans, and they are a group whose interests conflict with some of the aid alternatives. (3)

And, still another private beneficiary are those institutions--private universities, colleges, schools--who are able to attract students that otherwise would not have been able to attend. This effect is particularly relevant in the case of profit-making schools and agencies. (4)

Public Versus Private Benefits

While it is apparent that some material and non-material benefits accrue to both the public and private sector, it is not clear which set of benefits should be predominant in formulating aid policies. In other words, shall the benefits of aid to higher education be considered primarily public or private? The importance of this determination is particularly relevant in deciding who should bear the cost of the aid, or more realistically, how should the costs of the aid be apportioned? Nor should the costs of the activity be described entirely in terms of principal, interest, and direct administrative costs, but rather in the broader context of economic and psychological opportunity costs.

Considering the goals of the programs, and the differing benefits, how much can government, investors, and private citizens reasonably be expected to expend, in order to derive their respective benefits?

Controversial Assumptions in the Rationale

Prior to a description and tentative evaluation of the alternatives, this rationale must be examined, to see if any of the assumptions are controversial.

The basic assumption in the rationale is that increasing the general availability of public aid for undergraduate students will increase the proportion of persons in the 18-21 age group who actually secure college degrees. Actually, this is a questionable belief. It has been pointed out (9) that the proportion of high school graduates who attend and complete college programs has remained relatively stable in recent decades, and that the increase in college enrollment has been attributable to changing numbers of persons in the age group, and an increase--particularly among females--of the percentage of students who complete high school in the first place. It is also apparent that, given the increased availability of state and county subsidized institutions, the influence of resources available to an undergraduate student have a greater effect on where he goes to college, rather than whether he goes to college. Thus, if the only higher educational institutions were expensive private colleges and universities, it might be the

case that increased grants and loans would increase enrollment, but in the absence of this false constraint, the assumption is questionable.

A second important assumption, rarely challenged, is that there is a clear, uncontrovertible relationship between income and education. While past data on lifetime earnings vis. education overwhelmingly support this claim, it is not clear that this will always be such a marked correlation. Certainly, as the proportion of the total work force with college degrees increases, the market value of the degree must decrease. And, as college admission becomes less discriminatory and more public, the likelihood of career success for graduates will decrease.

In short, past correlations between education and income were in part attributable to the scarcity of college degrees and the success-oriented selectivity in the choice of candidates. As these social dimensions change, the earning-power of the degree will also change. (9, 10)

The income-education tie is also based on an assumption of an undersupply of the kinds of persons produced by the colleges. Today, there is not full employment--even for the best educated Americans--and the market value of the education has, in many instances, deteriorated. (Subsequent analyses in this paper will assume a return to a full-employment economy, at least for college graduates.)

These unresolved questions limit the credibility of the rationale behind both public and private investment in higher education. At the

very least, we should remember that since increased investment in education is likely to be subject to diminishing returns, the benefits of higher education will be reduced at the margin, although the overall benefits certainly will not be eliminated altogether.

SECTION III

ALTERNATIVE FEDERAL PROGRAMS

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ALTERNATIVE FEDERAL PROGRAMS

In this section we describe the characteristics of the principal student aid programs sponsored by the Bureau of Higher Education. These programs include the Educational Opportunity Grants, College Work Study, National Defense Student Loan, and Guaranteed Student Loan programs. We also discuss some of the proposed future programs.

Educational Opportunity Grants (2, 5)

In the Educational Opportunity Grants program (EOG), the Federal Government provides financial assistance, on the basis of need, to qualified undergraduate students. The grants are given directly to institutions of higher education, which then select the students who receive aid. The maximum EOG award to a student is \$1,000 per year. However, the EOG award must not be more than half of the total financial assistance given to the student by the institution. Graduate students are not eligible for support from the EOG program.

College Work-Study Program (2, 5)

The purpose of the College Work-Study program (CWS) is to stimulate the part-time employment of students attending institutions of higher education, particularly students from low income groups. The CWS program provides grants to institutions for partial reimbursement of wages paid to

students working on campus or off campus in public or non-profit organizations. Since August 20, 1968, federal grants have covered 80% of the student's wages. The remainder is paid by the institution, employer, or some other donor.

National Defense Student Loan Program (2, 5)

The purpose of the National Defense Student Loan program (NDSL) is to assist colleges in making low-interest loans to graduate and undergraduate students. The federal grants to an institution make up 90% of the loan fund, with 10% contributed by the institution. Students apply for loans to the institution in which they are enrolled. Undergraduates are limited to borrowing \$1,000 per academic year and \$5,000 total, while graduate and professional students are limited to \$2,500 per academic year and \$10,000 total. Repayment of the loan extends over a ten year period, starting nine months after the borrower ceases full or part-time study. An interest rate of 3% is charged during the repayment period.

Guaranteed Student Loan Program (2, 5)

In the Guaranteed Student Loan program (GSL), the loan is negotiated between a non-governmental lender (such as commercial banks, savings and loan associations, credit unions, insurance companies, etc.) and the student, with the Federal Government subsidizing part of the interest in some cases. The loan is insured by the State, a private non-profit agency,

or the Federal Government. A student is eligible to borrow if he is accepted for enrollment at an eligible institution. The maximum loan per academic year is \$1,500, with a total of \$7,500 per student. If the student's adjusted family income (adjusted for claimed exemptions) is less than \$15,000 per year, then the Federal Government will pay the interest on the loan while the student is attending school. The student pays the total interest at the negotiated rate during the repayment period, which begins nine to twelve months after graduation or withdrawal from school. The lenders making the loans to students are protected against loss by either a guarantee provided by State and private non-profit agencies or by direct Federal insurance. In the cases of most guarantee agencies, the Federal Government also provides for 80% (principal amount) re-insurance on claims that they pay to lenders.

Proposed Revision of Current Programs (12, 18)

The legislature is currently considering a comprehensive modification of these existing programs through the creation of a National Student Loan Association, "a private corporation chartered and established by the Federal Government" which would develop funds by issuing its own obligations, guaranteed against default, with which NSLA would "buy, sell, or warehouse student loan paper from colleges, banks, or other eligible lenders."

The NSLA program, working in conjunction with the Guaranteed Student Loan program would, presumably, eliminate interest ceilings on GSL loans, provide subsidies only on the basis of need (not to wealthy borrowers), eliminate pre-payment penalties, and eliminate some of the uncertainties now besetting borrowers, and compensate for vagaries of the money market.

The Contingent Repayment Alternative (10)

An approach being discussed at U.S.O.E., but not yet the subject of formal legislative proposal is the contingent repayment plan, or "Educational Opportunities Bank." Developed at MIT several years ago, and now being experimented with at some private colleges, this approach differs in that a borrower's indebtedness is a function of his subsequent earnings, rather than a fixed amount. The borrower repays a percentage of his earnings to the lender institution (in this case the college or university). This approach stresses the private benefit notion, and presumably ensures that a student's obligation will be based on his actual material benefits, rather than on some average or aggregate notion of what his benefits will be. The concept increases risk for the lender, and decreases it for the borrower.

Comparative Data on the Programs

The following tables are an attempt to compare the costs and award distributions of the various programs. The information is derived, mainly,

from the Bureau of Higher Education Factbook (1970); in some cases, because of uncertainties of data and differences in accounting procedures, the information is an approximation. The tables should be used to observe general comparisons, rather than precise comparisons.

Comparison of Total Awards

Table 3-1 is a comparison of the Total Subsidy for the various programs. These costs do not include the administrative and overhead expenditures, nor do they reflect pay-back of loans. The table shows the pool of monies available to students and institutions.

Funding (\$ in thousands)	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
National Defense Stud. Loan (Total Obligation)	30,896	40,654	57,945	74,532	90,940	109,632	131,619	181,663	199,044	181,685	185,887	194,226	199,044
Work-Study Program (Funds Available)							54,865	127,093	139,605	149,685	169,525	176,986	199,044
Educational Opportunity Grants (Expenditures)								46,503	92,517	116,435	144,787	164,600	199,044
Guaranteed Student Loan (Total Loan Volume)								77,492	248,494	435,848	686,675	839,666	1,019,044
Total	30,896	40,654	57,945	74,532	90,940	109,632	186,484	432,751	659,660	883,655	1,186,874	1,375,478	1,519,044

Table 3-1 Comparison of Total Awards

1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
57,945	74,532	90,940	109,632	131,619	181,663	199,044	181,685	185,887	194,226	200,000
				54,865	127,093	139,605	149,685	169,525	176,986	190,000
					46,503	92,517	116,435	144,787	164,600	165,000
					77,492	248,494	435,848	686,675	839,666	1,000,000
57,945	74,532	90,940	109,632	186,484	432,751	659,660	883,655	1,186,874	1,375,478	1,555,000

Table 3-1 Comparison of Total Awards

Total Student Beneficiaries

Table 3-2 compares the total number of college students receiving benefits from one of the programs. In this summary, the students on the 2nd, 3rd, or 4th year of the award are included; no differentiation is made between new and continuing awards.

	1965	66	67	68	69	70
it Defense						
Student Loans	319,974	377,722	395,000	429,000	455,998	455,800
Work-Study Program	115,000	275,000	300,000	352,436	385,000	375,000
Educational Opportunity Grants	123,165	202,055	258,175	280,600	290,200	
Guaranteed Student Loan	48,495	330,088	515,408	787,344	921,896	
Total *	434,974	824,382	1,227,143	1,555,019	1,908,942	2,042,896

* Because many students receive more than one form of aid, this count is duplicated students.

TABLE 3-2

STUDENTS RECEIVING BENEFITS

Family Income of Recipients

Table 3-3 shows the percentage distribution of aid to families of different gross taxable income for the 1968 and 1969 periods.

1968

	0-2,994	3000-5,999	6000-7,499	7,500-8999	9000-10,999	12,000-14,999	15000+
Nat Student Defense Loan	22.0	28.0	16.0	13.0	→	21.0	→
Work-Study Program	28.0	32.6	16.0	10.6	→	12.8	→
Ed. Opportunity Grants	29.0	40.0	16.0	10.0	→	5.0	→
Guaranteed Student Loan	14.8	16.6	11.3	11.3	22.2	14.8	9.0
<hr/>							
1969							
Nat Student Dep. Loan	23.0	26.0	15.0	13.0	→	23.0	→
Work-Study Program	28.0	29.5	15.5	11.2	→	15.8	→
Ed. Opportunity Grants	33.3	44.6	13.9	5.7	→	2.5	→
Guaranteed Student Loans	10.0	16.9	11.6	11.0	22.4	16.1	12.0

Table 3-3
Percentage Distribution of
Aid, by Family Income
(Gross Taxable)

Aid to Non-White and Spanish-Surnamed Americans

Table 3-4 shows the proportion of total aid, for each program, awarded to non-white and Spanish-surnamed Americans for 1969-- the latest year for which the data is currently available.

	% aid to n-w and S-S Americans	% uncertain
National Student Defense Loan	17.8	-
Work-Study Program	23.1	-
Ed. Opportunity Grants	30.1	-
Guaranteed Student Loan	8.3	3.0

Table 3-4
% of Aid Distributed to Non-White and
Spanish-Surnamed Americans,
1969

SECTION IV

COSTS OF CURRENT AID PROGRAMS

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COSTS OF CURRENT AID PROGRAMS

Two important questions are: what does it cost to provide a student with aid, and whom does it cost? In this section we compare the costs of the different aid programs discussed in the previous section, including the costs to the Federal Government, state government, institution, and student. Because the costs of the loan programs depend upon several parameters which are not known exactly (the default rate, collection rate, discount rate, and length of repayment), we will examine the sensitivity of these costs to variations in the unknown parameters. For definiteness, we assume that a freshman student will receive \$1,000 in aid from either EOG, CWS, NDSL, or GSL. We further assume that the student's adjusted family income is below \$15,000, so that the interest payment would be subsidized for a guaranteed loan. Next, we compare the costs of the \$1,000 in aid from each of the four programs.

Educational Opportunity Grant

If a student received a \$1,000 EOG payment, the following costs will be incurred:

1. Cost of \$1,000 to the Federal Government
2. Cost of administration to the institution for processing student application and selecting the aid recipients.

In the EOG program, up to 3% of the grant total is given to the institution by the Federal Government to compensate for administration costs. According to a recent survey of state scholarship commissions (22), the administration costs are within 3% of the total aid awarded for several states.* Hence, it probably is a good assumption that most of the administration costs are within 3% of the grant award aid; therefore the college is able to pass most of their administration costs back to the Federal Government. Thus we assume that the Federal Government incurs a cost of \$1030, while the unreimbursed administration cost at the college where the student is attending is negligible.

College Work-Study Program

If a student received \$1,000 in CWS wages, then the following costs will be incurred:

1. Cost of 80% of the wages (or \$800) to the Federal Government;
2. Cost of 20% of the wages (or \$200) to the student's employer;
3. Cost of administration to the institution for processing student applications and selecting the aid recipients.

The true cost of this program to the institution depends upon whether the student works for the institution and how much of this work would have been done if the CWS program were not in effect. If the student's work were

* In Iowa, the operating costs in 1969-71 were approximately .86% of the total grant expenditure; in Michigan, they were 2.3% for 1969-70; and in Illinois, they were 3.0% for 1970-71. The cost was as high as 10% for Minnesota in 1969-70, but this higher figure could be attributed to the initial start-up cost of the Minnesota grant program.

essential, then the college may actually reduce its costs through the work-study program. However, if the work is not essential, then the wage payment would have the effect of being a grant. For definiteness, we assume that the student does work for the institution, but not in an essential way, so that the cost to the institution is \$200.* In the CWS program, the Federal Government reimburses the institution for up to 3% of the total work-study expenditure (including the wages paid by Federal, institution, and other sources) to cover the administration costs at the institution. As in the case of the EOG program, we assume that the college is able to pass most of its administration costs back to the Federal Government. In summary, the costs for \$1,000 in CWS wages are assumed to be \$830 for the Federal Government and \$200 for the institution.

National Defense Student Loan Program

The cost analysis of the NDSL program is more difficult than that for EOG or CWS, due to three factors:

1. Since the student will repay his loan over several years, discounting should be used to determine the present value of the loan cost to the Federal Government, institution, and student; this calculation depends upon when the repayment period began, the length of the repayment period, and the discount rate used.

* It should be noted that if the work would have been performed in any event, the real cost to the institution is zero. Indeed, if the marginal revenue product of the student were in excess of the \$200, the cost to the institution would be negative.

2. Some of the students will default on their loans, and thus not all of the principal will be returned to the Federal Government or the institution. Of course, some of the defaulted loans will be returned eventually by a collection agency. In order to properly contrast the costs between grant and loan programs, it is necessary to consider the losses due to defaults in loans.

3. If interest on the student loan is tax deductible, then federal tax receipts will be reduced in the future as a result of the loan. This indirect cost to the Federal Government is not included in the following calculations and this results in an understatement of the cost of the loan program to the Federal Government.*

In the technical appendix, several formulas are derived which give the present value of loan costs. These costs are functions of several parameters:

1. The interest rate on the loan. In the NDSL program, the interest rate is 3% and is charged only during the repayment period.

*A calculation of this cost to the government would require an estimate of the marginal tax rate of the individual involved. If the marginal tax rate were 25 percent, then each year the government would bear an indirect cost of 25 percent of the interest payments of that year. This would be discounted and added to the Federal cost of the loan.

2. The start of the repayment period. As long as the student is in college, his loan is deferred. However, nine months after the borrower ceases full or part-time study, the repayment period begins. Our calculations assume that the first payment is due five years after a loan is given to a freshman.*

3. The length of the repayment period. The maximum length of the repayment period is ten years; however, the actual length can vary from one to ten years. We will examine the sensitivity of the costs to this parameter by considering two repayment periods: five and ten years.

4. Frequency of repayment. Depending upon the institution, the frequency of repayment can be monthly, bimonthly, or quarterly. Prior to November 1965, the loans could also be repaid on an annual basis. For simplicity, our calculations assume that the loans are repaid on an annual basis.

* This assumption is made for illustrative purposes only. A more refined calculation would require an estimate of the attrition rate of college borrowers.

5. Default Rate. The Bureau of Higher Education does not compute default rates for the NDSL program, but they do compute delinquency rates. Between 1959 and 1968, 8.9% of the loans were delinquent more than one day, and 5.9% were delinquent more than 120 days. The number of GSL loans that have defaulted (including death, disability, and bankruptcy) is less than 1% of the total loans given, but this low rate is due to the fact that most of the students who received GSL loans are still in college. Based upon the experience of other rates, the GSL default rate is expected to climb to at least 3%. Because of the uncertainty in the true value of the default rate for NDSL, we will compute the costs by assuming two different values: a low rate of 3% and a high rate of 5.9%.

6. Collection Rate. Not all of the defaulted loans will be lost. The Claims and Collection Section of the Bureau of Higher Education has an optimistic estimate of being able to collect \$.75 per dollar of defaulted GSL loans, at a collection cost of \$.20 to \$.25 per dollar; this gives a net return of about \$.50 per dollar of defaulted loans. A pessimistic estimate would be that only a net return of \$.25 per dollar of defaulted GSL loans could be collected. We will use these two estimates for the NDSL program as well.

7. Discount Rate. In order for the loan costs to be comparable to the grant and work-study cost estimates, it is necessary to discount the loan repayments over time. Three different discount rates could be used: one for the Federal Government, one for the institution, and one for the student. There is uncertainty in the appropriate values which should be used for these rates. For public investments, some economists suggest using the current government borrowing rate, the marginal efficiency of capital from the private sector, or a weighted average of the marginal cost of funds in different sectors of the economy. For the student, the discount rate could be as low as 3%, since that is the interest on his loan, or as high as 10% or 15%, since that could be his return from investments. Similarly, the discount rate for the institution could be the cost of borrowing funds or the profit rate on investments. Because of the uncertainty in the value of the discount rate to be used for government, institution, and student, we will discount the costs with four different rates: 3%, 8%, 13%, and 18%.

Because 90% of the principal of a NDSL loan is supplied by the Federal Government and 10% by the institution, 90% of the student repayments and defaults will be allocated to the Federal Government, while 10% of the student repayments and defaults will be allocated to the institution. As in the previous two programs, the Federal Government does pay the institution up to 3% of their total loan fund to compensate for administration costs in processing student applications. Table 4-1 gives the present value of the costs to the

Table 4-1

Present Value of the Costs to the Federal Government
For Making a \$1,000 NDSL Loan to a Freshman

Repayment Period	Default Rate	Collection Rate	Discount Rate	Present Value of Costs
5 years	.03	.25	.03	\$141.
5	.03	.25	.08	361.
5	.03	.25	.13	511.
5	.03	.25	.18	617.
5	.03	.50	.03	138.
5	.03	.50	.08	358.
5	.03	.50	.13	510.
5	.059	.25	.03	152.
5	.059	.25	.08	368.
5	.059	.25	.13	517.
5	.059	.25	.18	621.
5	.059	.50	.03	145.
5	.059	.50	.08	363.
5	.059	.50	.13	513.
5	.059	.50	.18	618.
10	.03	.25	.03	140.
10	.03	.25	.08	415.
10	.03	.25	.13	582.
10	.03	.25	.18	688.
10	.03	.50	.03	137.
10	.03	.50	.08	413.
10	.03	.50	.13	581.
10	.03	.50	.18	687.
10	.059	.25	.03	150.
10	.059	.25	.08	421.
10	.059	.25	.13	586.
10	.059	.25	.18	690.
10	.059	.50	.03	144.
10	.059	.50	.08	417.
10	.059	.50	.13	583.
10	.059	.50	.18	688.

Table 4-2

Present Value of the Costs to the Institution for Making
a \$1,000 NDSL Loan to a Freshman

Repayment Period	Default Rate	Collection Rate	Discount Rate	Present Value of Costs
5 years	.03	.25	.03	\$ 12.
5	.03	.25	.08	37.
5	.03	.25	.13	54.
5	.03	.25	.18	65.
5	.03	.50	.03	12.
5	.03	.50	.08	37.
5	.03	.50	.13	53.
5	.03	.50	.18	65.
5	.059	.25	.03	14.
5	.059	.25	.08	38.
5	.059	.25	.13	54.
5	.059	.25	.18	66.
5	.059	.50	.03	13.
5	.059	.50	.08	37.
5	.059	.50	.13	54.
5	.059	.50	.18	65.
10	.03	.25	.03	12.
10	.03	.25	.08	43.
10	.03	.25	.13	61.
10	.03	.25	.18	73.
10	.03	.50	.03	12.
10	.03	.50	.08	43.
10	.03	.50	.13	61.
10	.03	.50	.18	73.
10	.059	.25	.03	13.
10	.059	.25	.08	43.
10	.059	.25	.13	62.
10	.059	.25	.18	73.
10	.059	.50	.03	13.
10	.059	.50	.08	43.
10	.059	.50	.13	61.
10	.059	.50	.18	73.

Table 4-3

Present Value of a \$1,000 NDSL Loan to a Freshman Student

Repayment Period	Discount Rate	Present Value
5 years	.03	\$112.
5	.08	359.
5	.13	529.
5	.18	648.
10	.03	112.
10	.08	422.
10	.13	610.
10	.18	728.

Federal Government for making a \$1,000 NDSL loan to a freshman student, as a function of different parameter values. These costs include \$30 to cover institution administration expenses. Table 4-2 has the present value of the costs to the institution, as a function of different parameter values. And, Table 4-3 has the present value of the loan to the student, as a function of the length of the repayment period and discount rate. This latter table assumes that the student will not default on his loan. Note that in all three tables, the present values are most sensitive to the discount rate used, but are fairly insensitive to default rate, collection rate, and length of the repayment period. We briefly discuss how these tables can be interpreted. Consider the first line in Table 4-1. At a repayment period of 5 years, default rate of .03, collection rate of .25, and a discount rate of .03, the Federal Government would be indifferent between making the \$1,000 NDSL loan and a direct payment to \$141 to the student. * Tables 4-2 and 4-3 are interpreted in the same way.

* The \$1,000 NDSL loan involves an initial outlay of \$900 in principal and \$30 in administrative expense. This is reduced by the present value of repayments amounting to \$789, which leaves a net cost of \$141. If the institutional costs of the loan were borne directly by the Federal Government, the government would be indifferent between a \$1,030 loan and a direct payment of \$153 to the student.

Guaranteed Student Loan Program

Several arrangements are possible in the GSL program. Lenders making loans to students are protected against loss by either a guarantee provided by State and private non-profit agencies or by direct Federal insurance. In the case of most guarantee agencies, the Federal Government also provides for 80% reinsurance on claims paid to lenders. In this section, we will assume that a state agency will pay 20% of default claims, while the Federal Government will pay the remaining 80%. Our analysis of the cost of a \$1,000 GSL loan to a freshman is based upon the following assumptions:

1. The interest rate on the loan. In the GSL program, the interest rate is 7%. We assume that the adjusted family income of a borrower is less than \$15,000, so that the loan interest will be paid by the Federal Government while the student remains in school.
2. The start of the repayment period. The repayment period begins nine to twelve months after graduation or withdrawal from school. Our calculations assume that the first payment is due five years after a loan is given to a freshman.

3. The length of the repayment period. The length of the repayment period can also vary in this loan program. We will examine the sensitivity of the costs to this parameter by considering two repayment periods: five and ten years.

4. Frequency of repayment. In the GSL program, the frequency of repayment is monthly. For simplicity, our calculations assume that the loans are repaid on an annual basis.

5. Default rate. Because the GSL program is still young, the appropriate default rate is still not known. As discussed in the NDSL section, we will consider two possible values: a low rate of 3% and a high rate of 5.9%.

6. Collection Rate. Because the GSL program is still young, the appropriate collection rate is not known either. An optimistic estimate is that a net return of \$.50 per dollar of defaulted GSL loans could be obtained, while a pessimistic estimate is that only a net return of \$.25 could be obtained. We will use both estimates.

7. Discount Rate. In order for the loan costs to be comparable to the grant and work-study cost estimates, it is necessary to discount the loan repayments over time. In this case three discount rates could be used: one for the Federal Government, one for the State guarantee agency, and one for the student. We will compute the costs to each of these groups with four different rates: 3%, 8%, 13%, and 18%.

In the GSL program, the principal and most administration costs are supplied by the lender. Thus the only costs which we will allocate to the State are 20% of the default costs, and the only costs which we will allocate to the Federal Government are the interest subsidies and 80% of the default costs. Refer to the Appendix for a derivation of the formulas used for computing the present value of loans. In Table 4-4, the present value of the costs to the government for a \$1,000 GSL loan is given for different combinations of parameter values; these costs include an assumed interest subsidy for four years while the student attends college. The present value of the costs of a \$1,000 loan to the state agency is given in Table 4-5. And in Table 4-6, the present value of the loan to the student is given for different discount rates and repayment periods; in this table, we assume that the student will not default on his loan. As in the case for the NDSL tables, the present values are most sensitive to the discount rate used, rather than the length of the repayment period, default rate, or collection rate. Note that the present value of the loan to the student is negative for the case in

Table 4-4

Present Value of the Costs to the Federal Government
for Making a \$1,000 GSL Loan to a Freshman

Repayment Period	Default Rate	Collection Rate	Discount Rate	Present Value of Costs
5 years	.03	.25	.03	270.
5	.03	.25	.08	239.
5	.03	.25	.13	214.
5	.03	.25	.18	193.
5	.03	.50	.03	267.
5	.03	.50	.08	237.
5	.03	.50	.13	212.
5	.03	.50	.18	191.
5	.059	.25	.03	279.
5	.059	.25	.08	246.
5	.059	.25	.13	219.
5	.059	.25	.18	197.
5	.059	.50	.03	273.
5	.059	.50	.08	242.
5	.059	.50	.13	216.
5	.059	.50	.18	194.
10	.03	.25	.03	269.
10	.03	.25	.08	238.
10	.03	.25	.13	213.
10	.03	.25	.18	192.
10	.03	.50	.03	266.
10	.03	.50	.08	236.
10	.03	.50	.13	211.
10	.03	.50	.18	191.
10	.059	.25	.03	277.
10	.059	.25	.08	244.
10	.059	.25	.13	217.
10	.059	.25	.18	195.
10	.059	.50	.03	272.
10	.059	.50	.08	240.
10	.059	.50	.13	214.
10	.059	.50	.18	193.

Table 4-5

Present Value of the Costs to the State Agency
for Making a \$1,000 GSL Loan to a Freshman

Repayment Period	Default Rate	Collection Rate	Discount Rate	Present Value of Costs
5 years	.03	.25	.03	2.
5	.03	.25	.08	2.
5	.03	.25	.13	1.
5	.03	.25	.18	1.
5	.03	.50	.03	2.
5	.03	.50	.08	1.
5	.03	.50	.13	1.
5	.03	.50	.18	1.
5	.059	.25	.03	.5.
5	.059	.25	.08	4.
5	.059	.25	.13	3.
5	.059	.25	.18	2.
5	.059	.50	.03	3.
5	.059	.50	.08	2.
5	.059	.50	.13	2.
5	.059	.50	.18	2.
10	.03	.25	.03	2.
10	.03	.25	.08	2.
10	.03	.25	.13	1.
10	.03	.25	.18	1.
10	.03	.50	.03	2.
10	.03	.50	.08	1.
10	.03	.50	.13	1.
10	.03	.50	.18	1.
10	.059	.25	.03	4.
10	.059	.25	.08	3.
10	.059	.25	.13	2.
10	.059	.25	.18	2.
10	.059	.50	.03	3.
10	.059	.50	.08	2.
10	.059	.50	.13	2.
10	.059	.50	.18	1.

Table 4-6

Present Value of a \$1,000 GSL Loan to a Freshman Student

Repayment Period	Discount Rate	Present Value of Loan
5 years	.03	\$ 8.
5	.08	284.
5	.13	474.
5	.18	607.
10	.03	\$ -79.
10	.08	298.
10	.13	526.
10	.18	670.

which the repayment period is 10 years and the discount rate is .03. This occurs because the loan interest of .07 is sufficiently higher than the discount rate so that the present value of the student's repayments exceed the value of the loan.

Comparison of Aid Programs

We have discussed in detail the costs for the different student aid programs. These costs are summarized in Table 4-7 for each of the programs considered. Note that over the range of parameters that we considered, both the GSL and MDLS loan programs are less expensive to the Federal Government than the EOG and CWS programs.

Table 4-7

Costs of \$1,000 in Aid for Different Programs

Financial Aid Program	Federal Government Cost	State Government Cost	Institution Cost	Value of Aid to Student
EOG	\$1030.	\$0.	\$ 0.	\$1000.
CWS	830.	0.	200.	1000.
NDSL ¹	137.	0.	12.	112.
NDSL ²	690.	0.	73.	728.
GSL ¹	191.	1.	0.	670.
GSL ²	279	5.	0.	8.

¹ Assumes the combination of repayment length, default rate, collection rate, and discount rate that is most favorable to the Federal government; these values are used for state, institution, and student as well.

² Assumes the combination of repayment length, default rate, collection rate, and discount rate that is least favorable to the Federal government; these values are used for state, institution, and student as well.

SECTION V

SOME ECONOMIC IMPLICATIONS OF THE ALTERNATIVES

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SOME ECONOMIC IMPLICATIONS OF THE ALTERNATIVES

The purpose of this section is to consider the economic impact of student loans and grants as alternative methods of financing investment in higher education. Several simplifying assumptions are introduced in an attempt to focus on the fundamental differences in the economic impact of these two types of programs. The analysis is concerned with two sets of questions. First, the macro-economic impact of the two types of programs is considered. In this connection, we are concerned with such issues as the level and distribution of income in the society. Second, the micro-economic effects of the program are considered. Here, attention is centered on the impact of the alternative programs on the families of students and on the students themselves, both during the period of schooling and afterwards. This analysis is thus intended to provide a basis for an evaluation of the economic costs and benefits associated with these two types of programs and will help to clarify the economic issues that are involved.

Model Assumptions

In order to reduce the choice problem between loans and grants (or some mixture of loans and grants) to its simplest form while

retaining the essence of the problem. It is necessary to make several simplifying assumptions. The idealized situation that we envision at the outset is characterized by the following features: *

- (a) The number of students enrolled in institutions of higher education will be the same whether a loan or a grant program is in effect. **
- (b) The distribution of students by institution is assumed to be independent of the type of program in effect.
- (c) The quality of education, however measured, is invariant with respect to the type of program.
- (d) The administrative expense will be the same whether there is a loan program or a grant program. (This condition is, of course, not at all likely to hold and we will return to this point below.)

* These assumptions are made in order to examine the issues in their simplest form. The sensitivity of the conclusions that are reached to variations in these assumptions is investigated below (see pages 5-8 to 5-12).

** There are two points implicit in this assumption. First, the student response to loans is assumed to be the same as the response to grants. Second, the loan and grant programs to be compared are assumed to be scaled to accommodate the student response. These two aspects are considered below in some detail.

These four assumptions mean that the same amount of real economic resources will be devoted to investment in higher education under a loan program or under a grant program. Moreover, the real economic return to investment in higher education is also the same whether the investment is financed by a loan or by a grant.

In addition to these assumptions with respect to the level and return on investment in higher education, an assumption about the level of economic activity is made.

- (e) The economy will operate at the same level of capacity utilization independently of the type of program in effect.

The reason for this assumption is that it is useful to separate the allocation and distribution aspects of government policy from its stabilization aspects. The presumption is that the government has a number of options open to it to influence the level of income and employment. Each of these options should be evaluated on the basis of its impact on the rate of capacity utilization.

Macro-economic Effects of the Loan-Grant Mix

The macroeconomic effects of the choice between loans and grants for financing higher education will now be considered in some detail within the context of the set of assumptions introduced above. Initially, we assume that federal money alone is involved. Private sources of student loans will then be examined separately.

Whether the financing of higher education is accomplished through a federal loan program or through federal grants, the initial impact on the government budget is the same. To the extent that the program induces a larger number of students to attend college, there will be an increase in transfer payments to college students. In order to meet the increased demand for higher education, resources must be transferred from other sectors of the economy to higher education. The basic point is that with a constant rate of capacity utilization, there is no way that higher education can be expanded without a corresponding reduction of the output of goods and services elsewhere in

the economy. Moreover, such a transfer must take place irrespective of the loan-grant mix that is chosen (provided the loans plus the grants are constant, which implies equal effectiveness by assumptions (a) and (b)).

An important question that arises in connection with the transfer of resources away from other sectors of the economy is the extent to which consumption goods or investment goods production will be affected. If the output of investment goods bears most of the adjustment, then future levels of potential output are likely to be lower than otherwise, because there will be a smaller capital stock in the future. On the other hand, if consumption expenditure is reduced, investment expenditure might not be impaired. Whether it is the consumption goods sector or investment goods sector of the economy that is reduced as a result of the increase in resources used by higher education will be determined, in part, by the way in which the increase in government transfers is financed. There are essentially three distinct ways in which the increase in transfers might be financed: (a) increased taxation; (b) reduction in government expenditure on goods and services or a reduction in government transfer payments; or (c) an increase (decrease) in the government deficit (surplus) financed by the sale of government securities. In cases (a) and (b), of course, there is no increase (decrease) in the government deficit (surplus) and hence no impact on the government debt.

Without a detailed analysis of the precise methods that would be used to finance the increase in transfer payments, it is impossible to indicate anything more than the general impact of these alternative sources of financing. If the increased transfer were financed by an increase in personal income taxes, economists would generally agree that personal consumption expenditure would be reduced. If an increase in corporate profits taxes were instituted, investment expenditure might fall. But in this case, if the corporate profits tax is shifted either forward to consumers in the form of higher prices, or backward to wage earners in the form of lower wages, non-educational consumption expenditure would be expected to decline in this case also. If the loans or grants were financed through a reduction in other types of transfer payments, then college students will benefit at the expense of those groups that would have received transfer payments. If other public expenditure programs suffer, then there is likely to be less public investment than otherwise. Finally, if the funds are obtained through the sale of government securities, the likely impact would be an increase in interest rates and a reduction in the level of private investment expenditure.

This brief discussion of the alternative methods that are available to the federal government to finance an increase in loans or grants to college students is sufficient to indicate that the government

has a number of options available by which it can attempt to influence the immediate impact of an increase in the demand for higher education. The real economic resources need not come solely from other government programs, from private investment expenditure, or from personal consumption of other goods and services. The fact remains that the resources must be drawn from some sector of the economy, but as long as the same method is used to finance loans and grants, the immediate overall impact on the level and composition of economic activity will be the same.

We turn now from the immediate impact of the loan-grant mix to the longer-run effects of this choice. The basic difference between the two types of program is, of course, that the loan carries with it a repayment obligation, whereas the grant has no such obligation. What impact, if any, will this repayment obligation have on the productive capacity of the economy and hence the amount of goods and services available? The repayment of federally financed loans will result in an increase in government revenues. The effect of this increase in government receipts will depend on the way in which the government chooses to dispose of these receipts. However, unlike the immediate impact of the increase in loans (or grants), there is no demand on economic resources (abstracting from administrative expenses). Hence, the repayment of the loan involves only a redistribution of income.*

See footnote on next page.

*This redistribution of income may have an impact on the rate of capital accumulation and hence the rate of economic growth of the economy. If the redistribution results in an increase in the investment-income ratio, an increase in the rate of economic growth, at least in the short run, would be expected.

Thus far, it has been assumed that the loan program is financed entirely by federal funds. An alternative of current interest is the use of private funds in the form of commercial bank student loans. The use of private instead of federal funds does not alter the general conclusions that have been reached above nor does it eliminate the ambiguity with respect to which segments of the economy will operate at a lower level as a result of increased investment in higher education. To the extent that student loans are competitive in the capital market, the yield will have to equal or exceed the return on other types of loans and investment opportunities that are available to commercial banks. Whether it would be business loans, consumer loans, or mortgages that would be reduced as a result of an increase in student loans is extremely difficult to determine.

This analysis of the macroeconomic impact of the choice between loans and grants leads to the following conclusions.

(1) An increase in loans or grants results in a shift of resources away from other activities into higher education. The impact is the same whether loans or grants are used, provided the immediate cost of the programs is financed in the same way.

(2) The repayment of loans involves a redistribution of income, the impact of which depends on the way in which the government disposes of the increased receipts.

It follows that a choice between loans and grants must be based on considerations of equity, efficiency, and feasibility rather than on broad macro-economic implications. Before turning to this, however, it may be useful to indicate briefly how this general conclusion must be modified if the assumptions on which this analysis is based are altered. The discussion that follows is primarily conjectural, but it does indicate problems that are of importance and indicates the sensitivity of the conclusions that have been reached.

Suppose that contrary to assumption (a) student enrollment is sensitive to the type of student aid that is available. It might be argued, for example, that a grant program would induce higher enrollments than would a combined grant-loan program or a pure loan program. If this were true, the loan program would result in a smaller transfer of resources to higher education than would a grant program because the availability of loans will not attract as many students as a grant program. Moreover, in the short run, the total output available for consumption and investment would be higher with a loan program because there would be a smaller drain on the 18-21 year old work force. This assumes, of course, that 18-21 year olds who are not enrolled in higher education will be productive members of the work force. However, it is well known that the unemployment rate in this category is substantially higher than the overall unemployment rate.

A meaningful calculation of the impact of the choice between loans and grants would have to consider this problem carefully.

The longer-run, steady-state implications of the differential in enrollments resulting from a different response rate to loans and grants may also be important. The college graduate is typically more productive than the high school graduate with the same ability, motivation, and initiative. Moreover, the college graduate is less likely to experience periods of unemployment in later years than is the high-school graduate. Thus, social benefits aside, the longer-run impact of fewer college enrollments is likely to be a reduction in potential (i. e., full-employment) output. This means that a lower response rate to loans than to grants will result in a smaller decrease in current output but also a smaller increase in potential future output if loans rather than grants are available to finance higher education.

As explained previously, the student response to the alternative programs is only one aspect of the assumption that student enrollments are invariant with respect to the type of program that is instituted. The second aspect of this assumption that requires consideration is the supply of funds. If response rates were the same, then the annual supply of funds must be such as to accommodate the demand for student funds. It may be easier from a political point of view to obtain loan funds than to obtain an equal amount of grant funds because the loan comes with a

repayment obligation. If the principal and interest repayments accrue to the educational authority, then these funds can be used to finance more loans. Once a steady state is achieved, the loan program might become self-sufficient in the sense that the loan program would not be dependent on additional future Federal contributions for its continued existence.* A grant program, on the other hand, would obviously require continuing appropriations from the federal government to continue its operation.

The potential self-sufficiency of a student loan program brings with it several advantages over a grant program. If the program were self-sufficient, this would result in more continuity of the program than would be likely with a grant program. The need for annual appropriations to finance a grant program would introduce uncertainty about the future of the program. The availability of grant funds would not be known precisely in advance of the appropriation and the level of aid available might fluctuate substantially from year to year. The availability of funds under a loan program could be predicted with greater

* If the loan program were to involve subsidized loans, it is quite likely that the fund would not be self-sustaining and the infusion of new funds would be required. However, the new funds required each year would surely be less than the amount required under a grant program of equal effectiveness (in terms of student enrollment) because of the inflow of repayments which, according to our estimates, would exceed the administrative cost of the program.

certainty and this would permit more detailed long-term planning. Second, the self-renewing aspect of the loan program would probably make it more acceptable politically. One possible disadvantage of the loan program is that it could become an essentially autonomous agency subject to little or no outside review. It is conceivable, though perhaps not likely, that the agency could outlive its usefulness unless some mechanism for outside review were established.

The second assumption on which the initial analysis was based is that the distribution of students by institution is independent of the type of program in effect. It is extremely difficult to determine how the institutional mix would vary with respect to the availability of loans or grants. From the point of view of aggregate output, the institutional mix is probably not particularly important unless there are substantial differences in the quality of educational instruction at public and private institutions.* It would certainly be dangerous to

* There is, of course, the possibility that the general type of education differs between public and private institutions. For example, public institutions may be more responsive to regional needs than private colleges. An examination of these issues is beyond the scope of the present study.

infer from earnings data of graduates of public and private schools that public school instruction is inferior because earnings of public school graduates are lower than private school graduates. Prestigious private colleges and private schools generally are able to impose high entrance standards because applications far exceed the number of students that can be accepted. Public schools are often unable to impose similar entrance requirements so that the public school graduate may, on average, be less qualified than a private school graduate, regardless of the quality of instruction that is available. It does not seem unusually restrictive to assume that the quality of education is independent of the institutional mix, and hence that even if the loan-grant choice does influence the institutional mix, overall productivity will not be directly affected by changes in the institutional mix.

A related issue of some importance arises at this point. In particular, the choice between loans and grants to finance higher education might have some impact on student motivation and therefore on the overall impact on the productivity of investment in education. Even if there were no dilution in the level of ability of students, a pure grant program might have adverse affects on student initiative and receptivity to the educational experience. To the extent that a grant program leads to a reduction in the level of effort, the rate of return on investment in education would be reduced. And this would be an

implicit cost of a grant program relative to a loan program. However, experience with education financed by the GI Bill suggests that student motivation is not likely to be a substantial problem.

The final assumption that must be relaxed is that the administrative expense is the same in the case of a loan or grant program. This has been examined in some detail in the preceding section where it was found that the administrative expense associated with a loan program is likely to exceed that of a grant program for a number of reasons. This means that, in order to shift the same amount of resources into higher education, more economic resources are required by a loan program than by a grant program. This, then, is a real economic cost of a loan program as compared to a program of outright grants.

By way of summarizing this discussion, the following qualifications to the original conclusions emerge from this analysis.

(3) If student enrollment is more responsive to a grant program than to a loan program, a grant program will result in a greater short-run reduction in potential output. The longer-run impact, however, is a greater increase in potential output as a result of upgrading the overall quality of the labor force.

(4) To the extent that the choice between loans and grants to finance higher education has an impact on student incentive and receptivity to the educational experience, the return on investment in higher education will vary correspondingly.

(5) Since a loan program will almost certainly be more expensive to administer than a grant program, more resources will be required under a loan program to achieve the same enrollment target than would be the case with a grant program.

Equity, Efficiency, and Feasibility

A comparison of the macroeconomic impacts associated with the choice between federal loans and grants to finance higher education does not provide the ultimate answer to the selection problem. Equity considerations must also play an important part in the decision. Perhaps the basic issue involved here is the extent to which the benefits associated with higher education are appropriable by the individual recipient and hence the extent to which the recipient should be expected to pay for his own investment in education. This question of the public and private benefits of higher education appears in various forms and differing views of the importance of these two types of benefits are responsible for much of the debate over the extent to which higher education should be subsidized and what form such subsidies should take.

Because it is extremely important, it is useful to review briefly the basic rationale for public support of economic activities. In general, economists are inclined to be suspicious of any program of public financing of private activities. Their usual view is that there is little justification for an attempt to override the public will as expressed

as expressed through the body of consumers as to the appropriate composition of the nation's output of goods and services. If some product or service cannot generate enough demand to cover its cost of production, this implies that, to consumers, the product does not generate benefits in excess of its costs. In that case, the commodity fails the market test and there is little to be said for a program of government subsidies to rescue it. The economist's predilection for standards set by the market test means that economists are not inclined to recommend subsidies lightly.

Economic analysis does show, however, that there is an important class of goods and services for which the market test simply does not work. These are the outputs whose supply or whose consumption generates what economists designate "externalities." In the supply of such items, the free enterprise system is unable to respond adequately to the wishes of consumers. Government assistance to such activities is advocated not to override the wishes of consumers, but quite the contrary, as the only way to provide an adequate response to those wishes.

Education is frequently cited as an activity in which there are important externalities. Education is not, of course, a pure public good in that there are certain private benefits which are appropriable

by the recipient. Education does produce uncompensated side benefits for which a return cannot be exacted in the market place.

As a result of the fact that higher education generates both private and public benefits, it follows that too few resources will be devoted to higher education if the direct beneficiaries are required to pay the full costs of their education. At the same time, since there are private benefits involved, it is difficult to argue that the full costs of education should be borne by society. The mix of loans and grants used to finance higher education could be made to reflect the mix of private and public benefits associated with higher education. This would be consistent with the benefit criterion that is frequently employed in connection with taxation. The basic idea is that individuals should pay taxes in proportion to the benefits each receives. The same principle applied to education would assert that each student should be expected to contribute in proportion to his personal benefit and society should contribute in proportion to the public benefits that accrue to society generally.

There are, however, at least two practical problems associated with the application of this criterion of equity. First, it is extremely difficult, if not impossible, to quantify the public benefits of higher education. But even if this were possible, a second problem would remain, and this is the quantification of the private benefits that

accrue to any particular individual. The private return to investment in education is, from the point of view of any one individual, subject to a wide range of uncertainty. The return which one individual realizes on his investment may be many times the return to another individual with the same investment in education. In view of these two difficulties, a strict application of the benefit criterion appears to be impossible. This does not mean that this criterion should be abandoned completely, but it does suggest that a considerable amount of human judgment must be exercised in its application.

A second criterion that is frequently advanced in connection with taxation, and which is therefore applicable here, is the principle of equal sacrifice. In connection with higher education, this could be interpreted to mean that similarly situated individuals should be expected to pay equal amounts for their education. But this again does not resolve the difficult issue of how differently individuals and families in dissimilar situations should be treated. It is apparent, however, that the "means" tests that are frequently involved in connection with the allocation of college scholarships and (subsidized) loan funds are based to some extent on the equal sacrifice principle.

This discussion of the benefit and sacrifice criteria of equity indicates that there is no easy solution to the problem of selection of the loan-grant mix. Those who favor loans or a predominant loan

component in the loan-grant mix emphasize the private benefits that accrue to recipients of higher education and the consequent ability to pay for their education. Those who favor grants or a predominant grant component in the loan-grant mix can appeal to the existence of public benefits and the potential uncertainty of the purely private return. Finally, those who advocate a variable mix depending on the economic situation of the student recipient and his family point to the equal sacrifice criterion. There is no generally accepted philosophical principle to which one can appeal to resolve these different positions. Perhaps the most that an economist can (and should) do is to point out the implications of the alternative decisions.

Equity considerations aside, the concept of economic efficiency can be used to sort out those programs that are clearly inferior. A program is said to be inefficient if there is another program that achieves the same goals at a smaller cost. Like the equity criteria discussed above, however, the criterion of economic efficiency frequently does not narrow sufficiently the range of choices that are available. We have already mentioned the fact that a loan program is likely to be more expensive to administer than a grant program. If real resource cost were the only consideration, it seems clear that a grant program would be more expensive to society than a loan program.

But if the program is judged on the basis both of cost and the extent to which it satisfies the benefit criterion, then the increase in administrative cost may be the price that must be paid for requiring students to pay for at least part of the cost of education.

A final general criterion that must be considered is the feasibility of a specific proposal or set of proposals. Feasibility here refers to the question of whether the program can be expected to operate in the way in which it was originally designed to function. The feasibility argument has frequently been advanced in connection with private loans to students. The argument is that there are good reasons to believe that a private loan program will not provide at a reasonable interest rate the amount of funds that is needed to finance the educational expenses of all qualified students. Indeed, the financing of investment in education is considerably more difficult than financing of investment in plant and equipment. The primary reason for this, of course, is that students seeking financing very frequently have no tangible assets, so that the risk of student loans is typically greater than for conventional loans. This feature of the student loan market necessitates the introduction of an insurance requirement in the form of an explicit government guarantee, as in the case of the Guaranteed Student Loan program, or an implicit guarantee in the form of the proposed National Student Loan Association. The real

question, of course, is whether such guarantees will be sufficient to induce private lenders to meet the demand for student loans. However, it seems clear that without some such guarantee, a private loan program would not be feasible.

The purpose of this discussion has been to indicate that criteria of equity, efficiency, and feasibility are useful in the evaluation of alternative programs for financing higher education. The application of these criteria may help to focus discussion on the relevant issues involved in the public debate over alternative methods of financing higher education. These criteria are not meant to supersede the goals discussed in (8). Those criteria are concerned primarily with the rationale for aid to higher education and not specifically with the form of the aid. Additional criteria are needed to evaluate the alternative methods that might be used to achieve the basic goals advanced by the Office of Education. The preceding discussion represents a first step in this direction.

Impact of Student Loans on the Capital Market and Consumer Indebtedness

One aspect of a loan program to defray the expenses of higher education that requires investigation is the impact of the program on the capital market. If private loans are used to finance higher education, there is clearly a direct impact on the capital market. If federal funds are involved and these funds are obtained by issuing government securities, then again the capital market will be required to absorb the new issue. To the extent that the demand for student loans represents a net increase in the demand for credit, the interest rate is likely to rise unless an accommodating monetary policy is pursued by the Federal Reserve System. The magnitude of the change in the long and short-term interest rates that can be expected as a result of increased student loans is difficult to estimate precisely. One way to obtain a rough idea of the impact is to examine the relative magnitudes that are involved. For this purpose, it is useful to compare the amount that will be required for student loans with the amount of funds available in credit markets.

The amount of funds raised in U. S. credit markets each year over the period 1965-1969 is shown in Table 5-1. These annual totals include the funds raised by the U. S. Government, state and local governments, and all other nonfinanced sectors of the economy. These funds were supplied primarily by commercial banks, savings institutions and

insurance companies. The funds in the capital market were used primarily to finance government expenditure, purchases of consumer durables including automobiles (consumer loans), purchases of housing (mortgages), and investment in plant and equipment (business loans).

Table 5-1

Total Funds Raised in U.S. Credit Markets (billions of dollars)

Sector	1965	1966	1967	1968	1969
Total	70.4	68.5	82.6	97.4	88.2
U. S. Government	1.7	3.5	13.0	13.4	-36
All Other Non-Financial Sectors	68.7	64.9	69.6	84.1	91.9
Capital market instruments	39.1	39.9	48.0	50.5	53.6
Other private credit	29.5	25.0	21.6	33.6	38.3

Source: Federal Reserve Bulletin, May, 1970, P. A71.1.

The relationship between funds raised in the capital market and the nation's gross national product is shown in Table 5-2. It is interesting to observe that the ratio of new funds raised to gross national product has ranged between 9.1 and 11.3 percent over the period 1965-1969 and has averaged 10.1 percent per year. Excluding funds raised by the federal government, the ratio has ranged from 8.7 to 10.0 and has averaged 9.4 percent over this period.

Table 5-2
Gross National Product and Credit/Income Ratio

Item		1965	1966	1967	1968	1969
a	Gross National Product (billions)	684.9	749.9	793.5	865.7	932.1
	Total Funds Raised/GNP (%)	10.3	9.1	10.4	11.3	9.5
	Other Non-Financial Sector Funds/GNP (%)	10.0	8.7	8.8	9.7	9.9
b	Mortgage Debt Outstanding/GNP (%)	47.5	47.6	46.3	46.7	35.9
	Consumer Loans Outstanding/GNP (%)	14.2	14.2	13.6	14.3	14.1

Source: Federal Reserve Bulletin, May, 1970 and Table 5-1.

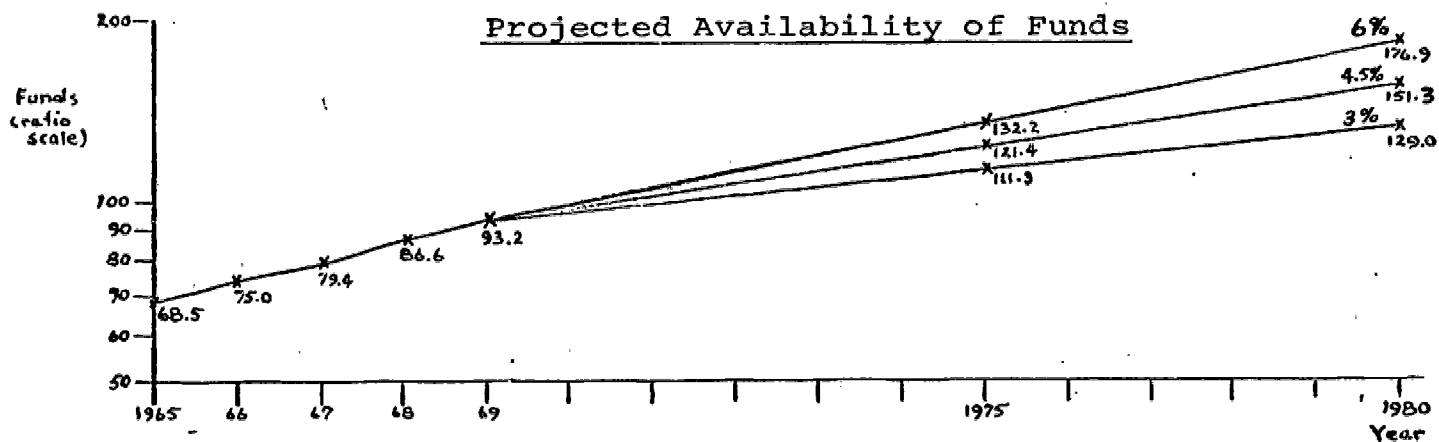
These observations suggest that a rough estimate of funds available at any future date can be obtained by multiplying the projected level of gross national product by 10 percent. On the assumption that real gross national product will increase at the rate of 2.6 percent per annum projected by the National Planning Association¹ and that inflation will be held to 1.9 percent per annum,² gross national product in current dollars will grow at 4.5 percent per annum over the next decade.

¹/ "National Economic Projections to 1976/77", p. 35.

²/ The assumed rate of inflation appears to be rather low by current standards. This is the figure used in the calculations given in (19). In order to ensure comparability, the same figure is used here.

and new credit availability can be expected to expand correspondingly. This projection procedure yields the results shown in Chart 5-1. The median projection gives an estimate of 151 billion dollars of funds available from the capital market in 1980. The slow-growth (3%) projection is 129 billion and the rapid growth (6%) projection is 177 billion dollars of new funds available in 1980. If the rate of growth of current dollar gross national product exceeds the 6 percent annum on which the high-growth projection is based, the projected availability funds in 1980 will, of course, exceed the 177 billion dollar projection.

Chart 5-1



These simple projections provide the basis for a determination of the impact of any specific student loan programs on the capital market. For illustrative purposes, an analysis of the impact of the proposed Educational Opportunity Bank will be considered here.* Estimates of the demands for student loans under the Ed Op Bank have been prepared by Shell, et al. (19) and are reproduced below in Table 5-3. These projections assume that the projected full costs (including tuition, fees, and subsistence) of higher education are borrowed by the students; that after five years of operation 80 percent of the full-time students borrows from the bank; and that the program is initiated in 1969 with a 16 percent participation rate increasing linearly to 80 percent in 1973.

The entries in Table 5-3 suggest that the demand for student loans will increase fairly rapidly initially and by 1973 will consume 10 percent of the loanable funds that are available to the capital market. This financial impact calculation does not, however, take account of the fact future repayments will reduce the net demand for loans. When this is considered, the financial impact on the capital market reaches a peak in 1975 and then begins to decline as repayments begin to occur in substantial amounts. The repayment stream that is used here is calculated on a 6.5 percent interest rate with a loan maturity of 40 years. A higher interest rate or a shorter repayment period would reduce this net impact to something below the ten percent maximum shown in the table.

* See footnote on next page.

*The following analysis is confined to the Educational Opportunity Bank because the estimates that are required for this program are readily available. It would have been desirable to include an analysis of the impact of other programs on the capital market, but this was simply not possible within the scope of this preliminary study. This analysis is intended primarily to be illustrative rather than definitive. The techniques used here could be used to investigate the financial impact of other programs.

There are reasons to believe that the financial impact of any loan program now in existence will be smaller than that shown in Table 5-3. Currently, there are no programs that permit a student to borrow the full costs of his education. Thus, the new loan entries in the table are likely to be inflated. Second, there may be an increased availability of funds as a result of more widespread use of student loan programs. The reason for this is that families that have been saving for the education of their children will no longer have as strong an incentive to do so. Moreover, the funds that have been accumulated will now be available for other purposes and instead of being used to cover educational expenses, these funds may find their way into the capital market. This affect will be moderated by the use of previously accumulated funds, together with loan money, to finance higher education at more expensive institutions.

Despite these qualifications, the results of this analysis suggest that the impact of student loans on the capital market is by no means inconsequential. The result of an increase in student loans is likely to be an increase in interest rates that will in turn lead to a reduction in mortgage loans, consumer loans, and business loans. Which of these components will be most sensitive to the anticipated change in the interest rate is difficult to say. However, if past experience is any guide, mortgage and consumer loans are likely to bear the brunt of the

Table 5-3
Student Loans, Repayments, and Capital
Market Impact, 1969-1980

Year	New Loans	Repayments	Capital Market	Financial Impact % (Adjusted for Repayments)
1969	1.6	0.0	88.2	2
70	3.5	0.0	97.4	4
71	5.6	0.0	101.8	6
72	8.1	0.0	106.4	8
73	11.0	0.2	111.2	10
1974	11.7	0.4	116.2	10
75	12.5	0.8	121.4	10
76	13.3	1.4	126.8	9
77	14.0	2.1	132.6	9
78	14.7	3.0	138.5	8
79	15.4	4.2	144.8	8
1980	16.1	5.6	151.3	7

Source: Shell, et al. and Chart 1.

adjustment. During periods of credit stringency, the mortgage market is usually the first to suffer. High interest rates typically discriminate against home buyers and the construction industry generally.

The sensitivity of mortgage credit to interest rate changes raises another important issue in connection with the feasibility of a student loan program. It has frequently been emphasized that private financial

institutions are reluctant to grant student loans because, in the absence of collateral, these loans are inherently more risky than consumer or business loans. Without some government guarantee it is therefore likely that student loans will be as volatile, if not more volatile, than mortgage loans. If so, student loans may be much easier to negotiate during periods of economic slack when the Federal Reserve System is increasing bank reserves through open market operations than during periods of credit stringency. In any event, it seems clear that it will be necessary to institute certain institutional safeguards to militate against the potential cyclical instability of student loans.

A more detailed study would be required to determine the quantitative impact of the student loan program on various components of consumer and business expenditure. One way to approach this problem is through the use of large-scale econometric models. Specifically, the Federal Reserve Board--Massachusetts Institute of Technology--University of Pennsylvania (FMP) econometric model might be useful in a more detailed report. The FMP model has been constructed specifically to analyze the impact of monetary policy changes in financial markets. Using this model, it would be possible to perform simulation experiments to determine the impact of the increased demand for loanable funds in various categories of expenditure. This, however, is beyond the scope of the present study.

Another important aspect of a student loan program is the indebtedness that will be built up during the years of schooling by loan recipients. Drawing again on the estimates of Shell (19), the Ed Op Bank projections of outstanding loans are shown in Table 5-4. In order to develop projections for mortgage debt outstanding and consumer loans outstanding, the ratio of each of these two components to gross national product for the 1965-69 period was computed. The results of these computations are shown in Table 5-2b. Mortgage debt outstanding averaged 46.8 percent of GNP during the 1965-69 period and consumer loans averaged 14.1 percent of gross national product. These ratios are used to obtain the projections of mortgage debt and consumer credit outstanding corresponding to a 4.5 percent rate of growth of gross national product over the 1970-1980 period.

Table 5-4

Projections of Outstanding Ed Op Bank Loans, Mortgage Loans, and Consumer Loans, 1970-1980 (billions of dollars)

Year	Ed Op Bank Loans Outstanding	Mortgage Debt Outstanding	Consumer Credit
1969	1.6	415	122
1970	5.1	456	127
1971	10.7	476	143
1972	18.7	498	150
1973	29.5	520	157
1974	40.8	544	164
1975	52.6	568	171
1976	64.5	593	179
1977	76.3	621	187
1978	87.9	648	195
1979	99.1	678	204
1980	109.5	708	213

Source: Shell, et al and Table 5-2.

Care must be exercised in the interpretation of these figures. The mortgage debt and consumer credit projections assume that past trends will continue and do not take account of the fact that these components may be reduced by an increase in student loans. These figures indicate that when the Ed Op Bank reaches its maximum 80 percent participation rate in 1973, student loan indebtedness will be approximately 6 percent of mortgage debt outstanding and 19 percent of consumer credit outstanding. By 1980 these percentages will reach 15 and 51 percent respectively, according to these projections. Once again, it should be emphasized that these are maximum figures, since the Ed Op Bank permits the student to borrow the full costs of his education. What these figures do suggest is that there may be a significant impact on consumption patterns as a result of this indebtedness and this should be explored rather carefully. In a real sense, however, this reflects only a transfer of the financial burden from one generation (families of students) to the following generation (the student). The real resource transfer occurs at the time the loan is granted, as emphasized in our discussion of the macroeconomic impact of student loan programs.

The impact on expenditure patterns of this indebtedness incurred through borrowing to finance the expenses of a college education can be explored by considering the reduction in income that results from the repayment of the loan.* One way to calculate this is to find the tax rate

*The calculations that follow abstract from the fact that interest payments are tax deductible. A more refined computation should take this into consideration.

per \$1000 borrowed that would yield a rate of return on the loan of r percent. This calculation assumes that the incomes of borrowers will increase at the projected national average of 4.5 percent annum, so that a constant tax rate will result in an increasing repayment stream. Shell, et. al. (19) find that a tax rate of 1 per cent per 1000 dollars borrowed will result in a 5.5 percent rate of return to the lender if repayments continue over 40 years. With a thirty-year repayment period, a 1 percent tax rate of \$1000 borrowed yields a 5.3 percent return. This means that the disposable (after-tax) income of a college graduate who borrowed \$5,000 during college at a 5.3 percent interest rate would be 5 percent less for 30 years than if he had not borrowed to finance his education. Even with this reduction in income however, the representative college graduate would be considerably better off than he would be if he had not attended college. This conclusion is based on Becker's estimate (21) that the after tax rate of return on a college education is about 12 percent. If the repayment period were shortened, the tax rate would have to be set higher to achieve the same rate of return. Similarly, if the required rate of return were set higher, a higher tax rate would be required for a given repayment period.

These figures give an indication of the orders of magnitude involved for a representative college graduate using the Educational Opportunity Bank. These calculations can also be used to indicate the financial burden of a conventional loan program that does not have a contingent repayment plan based on future earnings. For illustrative purposes, consider a 30 year, 5.3 percent conventional loan. The repayments for a representative college graduate^{*} will be 1 percent of his income per year per 1000 dollars borrowed.^{**} The college graduate who earns less than the norm will, with a conventional loan, be paying more than 1 percent of his income. Conversely, a graduate with higher-than-average earnings will pay less than 1 percent of his income per \$1000 borrowed. There is also a dynamic aspect of a conventional loan that differentiates it from a contingent loan of the Ed Op Bank variety. In particular, with a constant annual installment payment, the fraction of income that is consumed by the loan payment is larger in the earlier, low-income years and smaller in the later high-income years. The 1 percent figure per thousand dollars borrowed used above permits variable repayments, whereas the conventional loan does not permit repayments to increase over time. Precise calculation of the distribution of financial burden of conventional loans is not possible within the scope of this study. However, it is possible to indicate what data would be needed

^{*} See footnotes on next page.

* A "representative college graduate" is used to describe a college graduate who has an annual income equal to the mean annual income of college graduates.

** This follows from the calculations given in Shell, et. al. (19) which were quoted in the previous page.

and to sketch a format within which the calculation could be carried out. First, it is necessary to construct a repayment table based on the rate of return (i. e., interest rate) required and the term of the loan. Next, the projected distribution of borrowers by income class must be obtained. Finally, these two tables provide the information that is necessary to compute the equivalent tax rates. An important advantage of carrying through these calculations explicitly is that it would permit the introduction of Federal tax liabilities at different income levels, and, hence, would provide a basis for calculation of implicit tax rates or after-tax income. These results would provide a basis for making judgments about the equity of various types of financial repayment options and would permit a more detailed investigation of the way in which the indebtedness resulting from student loans is likely to influence consumption-patterns.

By way of summarizing the results of this discussion, we note the following:

- (1) Estimates of the demand for student loans associated with the proposed Educational Opportunity Bank suggest that the funds required by the program approach 10 percent of the loanable funds available in U. S. credit markets. Although the maximum is not likely to be realized under any of the current loan programs, the potential order of magnitude is

sufficiently large to engender real concern with respect to the impact on capital markets. In order to investigate these potential impacts in detail, computer simulation experiments with a large-scale econometric model will be required.

- (2) To the extent that a loan program reduces the incentive for household saving for future educational expenses, household consumption behavior is likely to change. This will, of course, be a transitory change since future generations, instead of saving to finance their children's education, will be saving to pay for their own education. The immediate impact of the reduced incentive to save will probably result in some stimulus to consumption demand.
- (3) The impact of the indebtedness incurred by student borrowers can be investigated by converting the required repayments into an average tax rate. The Educational Opportunity Bank calculations suggest that a 1 percent tax rate per thousand dollars borrowed is required for the representative college graduate to repay a 5.3 percent, 30-year loan.* This reduction in disposable income will, of course, have an important impact on the future expenditure decisions of loan recipients. In view of the potential magnitudes involved, this aspect of a loan program deserves detailed investigation.

* See footnote on next page.

* The loan size which Shell et. al. (19) consider is based on the assumption that students borrow the full cost of education including a subsistence allowance. Thus, the average loan size depends on the cost of living, the cost of tuition, etc. and is not readily obtained. See Shell et. al. (19) for a further discussion.

SECTION VI

THE NATIONAL STUDENT LOAN ASSOCIATION: COMMENTS AND RECOMMENDATIONS

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Given the broad range of social, educational, and economic consequences that may follow from a given aid program, it is possible to describe what some of these consequences may be for the proposed National Student Loan Association.

Apparent Goals of the NSLA

NSLA is designed to address certain needs not adequately addressed by the current package of grant and loan programs. Among these are:

- even the guarantee of the Guaranteed Student Loan program does not oblige banks to issue loans to certain students in particular, because of the economic background of the students. (Some banks also require that GSL recipients maintain savings accounts or use other bank services as a condition of the loan).
- changes in the availability of money, or the prevailing interest rates can result in reduced inclinations on the part of commercial lenders to participate
- that government's role in subsidizing the GSL is not entirely related to the economic need of the borrower

The goal of NSLA is to broaden the accessibility of financial assistance, while overcoming some of the problems outlined above. Its general strategy, outlined earlier, is to create a "secondary market" for student loan paper, and become, in effect, a "bank of last resort" for students.

It also endeavors to make more equitable the relationship between government subsidy and student need, and to eliminate the year-to-year uncertainty about money a student can expect to receive.

Probable Consequence of NSLA

1. Clearly, an extensive loan program for borrowers without collateral requires governmental guarantees. NSLA broadens the guarantee, by not only ensuring against default, but providing the banks with a market for their least attractive paper.
2. NSLA appears to broaden the base of risk-sharing, but probably its effect will be to virtually eliminate the "down-side risk" to commercial lenders, who will not only be able to get bad debts repaid, but also will be able to sell loans when the capital could be re-invested at a higher return. NSLA can become a highly profitable system for enhancing bank profits, making no-collateral student loans an even more attractive investment than home mortgages, where the lender may have to stay with a given interest return for 20-30 years, even though the prevailing rates have gone higher.
3. While NSLA will bring greater numbers of low income families into eligibility for loans, it still places a repayment burden on those who, despite their education, will probably have more difficulty repaying the loans than those who arrange

financing privately; thus it may be desirable to provide grants to some low-income students or to allow a contingent repayment plan (such as the Education Opportunities Bank).

4. The phasing out of loans administered through the colleges themselves will relieve an appreciable burden upon the institutions.
5. Great administrative care must be exercised to ensure that the National Student Loan Association does not become a massive program of subsidized speculation in student-loan paper, while appearing to be a program that benefits students. After all, it is in the self-interests of banks and other industry that as many persons as possible receive college educations, and thus, the commercial lenders should bear some of the cost of investment in a stock that will return them a profit as well.

APPENDIX

THE COST OF STUDENT LOANS

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Repayment

The first step in the calculation of the cost of student loans is to calculate the annual payments per dollar of loan received by the student. This will depend on four factors: the year, k , in which the loan is made, the interest rate, r , the maturity of the loan, n , and the interest option that is in effect during the period in which the recipient is in school. Two interest options are considered here. Under the first option, interest payments are deferred until the student graduates and the student is required to repay both the principal and the accrued interest. Under the second option, the interest payments are waived during the school years.

1. Interest Deferment

Suppose the loan is made at the beginning of the student's k^{th} year in college ($k = 1, 2, 3, 4$). Since all interest and principal payments are deferred until one year following graduation, it follows that the first payment is made $6-k$ years after the loan is received. For example, if the loan is made at the beginning of the student's senior year ($k=4$), repayment begins at the end of the first year after graduation or two years after the loan was granted. With an interest rate, r , the annual repayment R per dollar of loans must satisfy

$$(1) \quad 1 = R(1+r)^{-(6-k)} + R(1+r)^{-(6-k+1)} + \dots + R(1+r)^{-(6-k+n-1)}$$

$$= R(1+r)^{-(5-k)} [1 - (1+r)^{-n}] / r.$$

The solution of this equation for R yields

$$(2) \quad R = r(1+r)^{(5-k)}[1-(1+r)^{-n}]^{-1}$$

for the annual repayment per dollar of loan.

2. Interest Waiver

If all interest payments during the years of schooling are waived, the annual repayment per dollar of loan must satisfy

$$(3) \quad 1 = R(1+r)^{-1} + R(1+r)^{-2} + \dots + R(1+r)^{-n}$$

$$= R[1 - (1+r)^{-n}]/r.$$

The difference here is that the initial loan does not begin to accumulate interest until after graduation. If interest were to accumulate as in the case of the deferment option, the left-hand side of (3) would be replaced by $(1+r)^{5-k}$ which represents the principal plus accrued interest over the $5-k$ years of schooling since the loan was negotiated. With the waiver option, however, the annual repayment per dollar of loan is

$$(4) \quad R = r[1 - (1+r)^{-n}]^{-1}.$$

Present Value of Repayments and Loan Cost

The present value of the repayment stream is given by

$$(5) \quad PVR = R(1+g)^{-(6-k)} + R(1+g)^{-(6-k+1)} + \dots + R(1+g)^{-(6-k+n-1)}$$

$$= R(1+g)^{-(5-k)}[1 - (1+g)^{-n}]/g$$

where g is the rate at which future receipts are discounted. The present value of the cost per dollar of student loan is thus

$$(6) \quad C = 1 - PVR$$

which depends on the interest option that is in effect (which determines R), the term of the loan, the interest rate on the loan, and the discount rate used to determine the present value of repayments. This cost calculation is nothing more than a first approximation since it neglects both administrative expense and default risk.

Administration expenses can be handled fairly simply by supposing that every dollar of loan requires α expenditure for administration. With this modification, the cost is now given by

$$(7) \quad C = 1 + \alpha - PVR$$

where PVR is again determined by (5).

Default Risk

In order to introduce default risk, it is assumed that the fraction β of all the loans made at a given point in time will at one time or another go into default. This means that the present value of loan repayments consists of two components: The present value of repayment on loans that do not go into default plus the present value of loans that do go into default. In symbols, we have

$$(8) \quad PV = (1 - \beta)PVR + \beta PVD$$

for the present value PV of all repayments on loans, where PVR is given by (5) and PVD is the expected present value of loans that will go into default.

Thus, to include defaults into the model, PV replaces PVR in (7).

The determinants of PVD will now be considered. It is obvious that PVD depends on two factors: the date at which the borrower defaults on the loan and the amount that is collected when the loan is in default. Since we are considering a large number of loans, it is not unreasonable to suppose that defaults are distributed uniformly over the life of the loan. Let us suppose that μ loans are made at a particular date. Over the following n years $\beta\mu$ of these loans will go into default. We assume here that $\beta\mu/n$ go into default in year 1, $\beta\mu/n$ go into default in year 2, and so on. In addition, we suppose that the $\beta\mu/n$ loans that go into default in any given year are discovered at the end of the year as a result of non-payment. Thus a loan that goes into default in payment year t has generated $t-1$ payments. The present value of these payments is given by

$$(9) \quad D_1(t) = \begin{cases} 0 & t = 1 \\ (1+g)^{-(5-k)} [R(1+g)^{-1} + R(1+g)^{-2} + \dots + R(1+g)^{-(t-1)}] & t \geq 2 \end{cases}$$

$$= \begin{cases} 0 & t = 1 \\ (1+g)^{-(5-k)} R [1 - (1+g)^{-(t-1)}] / g & t \geq 2. \end{cases}$$

In addition to the present value of the payments that have been made before the loan goes into default, it is assumed that the fraction γ of the

unpaid principal is recovered. The unpaid principal at time t depends on the interest option that is employed. Under the deferred interest option, the unpaid principal per dollar of loan at the beginning of the repayment period is

$$(10) \quad P_0 = (1+r)^{5-k}.$$

After the first payment, the unpaid principal is

$$(11) \quad P_1 = P_0 - (R-rP_0) \\ = (1+r)P_0 - R.$$

In general, after the t^{th} payment, the unrecovered principal is

$$(12) \quad P_t = (1+r)P_{t-1} - R.$$

The general solution of this difference equation is

$$(13) \quad P_t = c(1+r)^t + R/r$$

where the arbitrary constant c is determined by the initial condition (10).

In particular,

$$(14) \quad P_t = [(1+r)^{5-k} - R/r](1+r)^t + R/r$$

for $t = 0, 1, \dots, n-1$.

The present value of the fraction γ of the unrecovered principal on a loan in default at payment t is

$$(15) \quad D_2(t) = (1+g)^{-(5-k+t+1)} \gamma P_{t-1}.$$

This formula assumes that the unrecovered principal, P_{t-1} , is collected one year after the loan goes into default. Hence the factor $(1 + g)^{-(t+1)}$ in (15).

Combining (9), (14), and (15), we have

$$(16) \quad D(t) = \begin{cases} \gamma(1+r)^{5-k}(1+g)^{-(7-k)} & t = 1 \\ (1+g)^{-(5-k)} \left[R [1 - (1+g)^{-(t-1)}] / g \right. \\ \left. + \gamma(1+g)^{-(t+1)} \left\{ [(1+r)^{5-k} - R/r] (1+r)^{t-1} + R/r \right\} \right] & t \geq 2 \end{cases}$$

for the present value of the proceeds of a loan that goes into default of payment t . Since defaults are assumed to be uniformly distributed, it follows that PVD per dollar of loans is given by

$$(17) \quad PVD = \frac{1}{n} \sum_{t=1}^n D(t).$$

A closed form expression for this sum can be obtained for computational purposes. However, it is so complicated that it does not lead to any useful insights so it is not given here.

As mentioned above, this calculation of PVD is dependent on the interest option that is selected. If the interest waiver is in effect then the computation leading to (17) must be modified as follows. The unpaid principal at the beginning of the repayment period is

$$(10') \quad P_0 = 1.$$

Equations (11), (12), and (13) remain the same but (14) now becomes

$$(14') \quad P_t = [1 - R/r] (1 + r)^t + R/r.$$

Equation (15) is the same and equation (16) becomes

$$(16') \quad D(t) = \begin{cases} \gamma (1 + g)^{-(7-k)} & t = 1 \\ (1 + g)^{-(5-k)} \left[R[1 - (1 + g)^{-(t-1)}]/g \right. \\ \quad \left. + \gamma(1 + g)^{-(t+1)} \left\{ (1 - R/r) (1 + r)^{t-1} + R/r \right\} \right] & t \geq 2 \end{cases}$$

Loan Cost

The formulas that have been derived above can now be used to calculate the cost per dollar of student loan. The parameters of the model are as follows:

- r: interest rate on the student loan
- n: number of annual payments
- k: the year of enrollment of the student when the loan is granted
(1 = freshman, 2 = sophomore, etc.)
- g: the discount rate applied to future repayments and receipts from default collections
- α : administrative costs per dollar of loan
- β : the fraction of loans issued at a given point in time that eventually go into default
- γ : the fraction (net of costs) of the unrecovered principal at the time the loan goes into default then is collected

The present value of the cost per dollar of student loan is:

$$(18) \quad C = 1 + \alpha - (1 - \beta) PVR - \beta PVD$$

$$(5) \quad PVR = R(1+g)^{-(5-k)}[1-(1+g)^{-n}]/g$$

$$(2) \quad R = r(1+r)^{(5-k)}[1-(1+r)^{-n}]^{-1}$$

$$(17) \quad PVD = n^{-1} \sum_{t=1}^n D(t)$$

and

$$(16) \quad D(t) = \begin{cases} \gamma(1+r)^{5-k}(1+g)^{-(7-k)} & t = 1 \\ (1+g)^{-(5-k)} \left[R[1-(1+g)^{-(t-1)}]/g \right. \\ \left. + \gamma(1+g)^{-(t+1)} \left\{ [(1+r)^{5-k} - R/r] (1+r)^{t-1} + R/r \right\} \right] & t \geq 2, \end{cases}$$

on the assumption that the interest on the loan is deferred until the student graduates. If the interest that accrues is waived, then (2) is replaced by (4) and (16) is replaced by (16').

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